

Do paternal arrest and imprisonment lead to child behaviour problems and substance use? A longitudinal analysis

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Background: Children of prisoners are at increased risk of impaired health, behavioural problems and substance misuse; however, the causal pathways to these problems are unclear. Under some circumstances, parental imprisonment may result in improved outcomes for the child. This study investigates the impact of paternal arrest and imprisonment on child behaviour and substance use, as a function of child gender, and in the context of known social and familial risk factors. **Methods:** Longitudinal analysis of an Australian birth cohort ($N = 2,399$) recruited 1981–83, with child outcomes measured at age 14. Participants were recruited prenatally from a large, public hospital in Brisbane, Australia and followed up in the community. History of paternal arrest and imprisonment were based on maternal self-report, at age 14. Outcome measures included mother- and child-reported internalising and externalising behaviour (CBCL and YSR), and child self-reported alcohol and tobacco use. **Results:** In univariate analyses, paternal imprisonment was associated with maternal reports of increased child internalising ($OR = 1.82$, 95%CI 1.08–3.06) and externalising ($OR = 2.24$, 95%CI 1.41–3.57), and alcohol use ($OR = 1.68$, 95%CI 1.11–2.53) at age 14. However, controlling for socio-economic status, maternal mental health and substance use, parenting style and family adjustment, these associations became non-significant. For boys only, in the multivariate model paternal arrest but not imprisonment predicted alcohol ($OR = 1.79$, 95%CI 1.09–2.95) and tobacco ($OR = 1.83$, 95%CI 1.03–3.25) use at age 14. **Conclusions:** The association between paternal arrest and imprisonment and adverse outcomes in adolescence is accounted for by well-established social and familial risk factors. Paternal imprisonment may not, in itself, increase the risk for child behaviour and substance use problems. **Key-words:** Paternal imprisonment, internalising, externalising, alcohol, tobacco, longitudinal study. **Abbreviations:** CBCL: Child Behaviour Checklist; DAS: Dyadic Adjustment Scale; DSSI: Delusions-Symptoms-States Inventory; MUSP: Mater University Study of Pregnancy; YSR: Youth Self-Report.

In most countries around the world the prison population is growing at a rate which exceeds general population growth (Walmsley, 2005). Many of those entering custody leave dependent children in the community, often in the care of a (usually female) partner: A study of state prisoners in the United States found that about two-thirds of incarcerated women and more than half of incarcerated men were parents of children less than 18 years of age (Bureau of Justice Statistics, 1993). More recent figures suggest that in 1999 almost 1.5 million children in the United States – 2.1% of all children aged under 18 years – had a parent in a state or federal prison (Mumola, 2000). In Australia, where about 93% of adult prisoners are male (ABS, 2006), a recent study estimated that 4.3% of all children aged under 16 in New South Wales had experienced parental incarceration (Quilty, Levy, Howard, Barratt, & Butler, 2004).

A number of authors have speculated on the impact of incarcerating a parent on the health and well-being of their child, pointing to the trauma of witnessing a parent being arrested and imprisoned, the ongoing stress and stigma associated with

having a parent in prison, and the economic impact of having one parent (usually the income-earning father) removed from the family environment (Arditti, 2005; Hanlon et al., 2005; Phillips, Burns, Wagner, Kramer, & Robbins, 2002; Walsh, 2004). However, most of the studies that have explored the relationship between parental incarceration and child outcomes have been limited by small, non-representative samples and a failure to consider potential confounders and mediators. One notable exception is a prospective study of 411 boys in the United Kingdom, which compared those who had experienced parental imprisonment by age 10 with those who had experienced parental absence for other reasons, or had never experienced parental absence. Compared with the other groups, the children of prisoners exhibited higher rates of antisocial behaviour, even after accounting for individual, parenting and family risk factors (Murray & Farrington, 2005). Although this study provides some support for the view that parental incarceration can impact on child functioning, the sample included only 40 children who had experienced parental incarceration, was unable to determine whether other risk exposures occurred before or after paren-

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tal imprisonment, and did not consider other important outcomes, including internalising behaviour and substance misuse (Murray & Farrington, 2005). The evidence for a causal link between parental imprisonment and worse child outcomes therefore remains limited. Despite this, calls continue for increased support and preventive interventions, specifically for the children of prisoners (Goulding, 2004; Hagan & Dinovitzer, 1999; Quilty et al., 2004; Woodward, 2003).

Furthermore, although there is some evidence of poor outcomes for the children of prisoners, it does not necessarily follow that imprisonment of a parent always has negative consequences for the child. One recent study of more than a thousand twin pairs and their parents in England and Wales found that the impact of paternal absence on child behaviour depended on characteristics of the father: among children whose father engaged in low levels of antisocial behaviour, paternal absence was associated with more child conduct problems. Conversely, for fathers who engaged in high levels of antisocial behaviour, paternal absence was associated with fewer child conduct problems (Jaffee, Moffitt, Caspi, & Taylor, 2003). Similarly, a recent prospective study found that it was paternal arrest (indicating the presence of a father modelling antisocial behaviour) and *not* imprisonment that predicted cannabis use in young adults (Hayatbakhsh, Kinner, Jamrozik, Najman, & Mamun, 2007). These studies suggest that paternal incarceration may be less problematic than exposure to paternal modelling of antisocial behaviour during childhood, although this modelling effect may be stronger for boys (Thornberry, Freeman-Gallant, Lizotte, Krohn, & Smith, 2003). For children whose father engages in regular antisocial behaviour, imprisonment of the father may therefore be 'the lesser of two evils', at least as far as the child is concerned.

Evidence of impairment among the children of prisoners is also insufficient to demonstrate a causal link between parental incarceration and poor child outcomes. The association may be explained by other, more proximal factors, and these factors may or may not be unique to the children of prisoners. Indeed, many of the poor outcomes evident among the children of prisoners (e.g., behaviour problems, internalising, substance misuse) are also evident among other disadvantaged children (Najman et al., 2004), suggesting that despite their relative disadvantage, the children of prisoners may not be uniquely disadvantaged. Findings from the *Mater University Study of Pregnancy* (MUSP), an Australian birth cohort study, have identified a number of important risk factors for externalising, internalising and substance use problems among adolescents, including socio-economic disadvantage, early motherhood, marital discord, unstable family circumstances, maternal substance use and poor maternal mental health (Alati et al., 2005; Bor,

McGee, & Fagan, 2004; Hammen, Brennan, & Shih, 2004; Hayatbakhsh et al., 2006; O'Callaghan et al., 2006; Shaw, Lawlor, & Najman, 2006; Spence, Najman, Bor, O'Callaghan, & Williams, 2002). The mechanisms linking these risk factors to poor child outcomes are complex, but one important factor is likely to be parental modelling of behaviour, particularly by the same-sex parent (Thornberry et al., 2003). Any investigation of the association between parental incarceration and poor child outcomes must take these other risk factors, and possible gender differences in the impact of these risk factors, into account.

Using data from the MUSP study, the present study examined outcomes for children of arrested and imprisoned fathers, across a range of domains, taking into account social and familial factors thought to impact child functioning. The study addresses two specific questions:

1. Is there a relationship between paternal arrest/imprisonment and subsequent poor child behaviour, mental health and substance use in adolescence, and do these relationships vary by child gender?
2. To what extent are these relationships accounted for by other risk factors?

Method

Data for this paper were taken from the MUSP study, a longitudinal study of mothers and their children. Between 1981 and 1983, 8,556 consecutive women attending their first obstetric visit at the Mater Misericordiae Hospital in Brisbane, Australia were invited to participate in the study. A sample of 7,223 live singleton babies, for whom both maternal interviews and obstetric data were available at discharge from hospital, constitutes the MUSP birth cohort. Mothers and children were followed up 3 to 5 days, 6 months, 5 and 14 years after the birth. The study population and recruitment methods have been described extensively elsewhere (Keeping et al., 1989; Najman et al., 2005). Mothers participating in the study provided written informed consent at all phases. At the 14-year follow-up, mothers gave written consent on behalf of their children, who completed an individual questionnaire for the first time. Children were told that they were free to withdraw if they did not wish to proceed with the interview. Ethical approval for each phase of the study was provided by the University of Queensland's *Behavioural and Social Sciences Ethical Review Committee* and the Mater Misericordiae Hospital's ethics committee.

Participants

The cohort for this paper consists of a subgroup of 2,399 adolescents (1,247 males, 1,152 females), for whom complete data on paternal criminal history and

all other variables of interest was available. The present analyses draw on data collected at the antenatal visit and at the 5- and 14-year follow-up phases.

Measures

Outcome variables: mental health, behaviour problems and substance use at 14 years. At 14-year follow-up, mental health and behaviour problems were assessed using the internalising and externalising symptom subscales of the Youth Self Report (YSR) and the Child Behaviour Checklist (CBCL; Achenbach, 1991b). Validation studies with both clinical and population samples have reported factor structures and reliability estimates consistent with Achenbach data (Achenbach, 1991a). The use of the CBCL and YSR in the MUSP study has been described extensively in previous papers, which also report on the validity and internal consistency of the scales (Alati, Najman, & Williams, 2004). Scores in the top 10% are likely to reflect symptoms of child psychopathology (Achenbach, 1991a, 1991b), so scale scores were dichotomised with those in the top 10% considered to exhibit clinically significant internalising or externalising symptoms.

We selected having consumed a full glass of alcohol and smoking at age 14 as indicators of substance use in adolescence, since evidence from longitudinal studies shows that early initiation to tobacco and alcohol use are the strongest predictors of the most severe sequelae of alcohol and nicotine disorders in adulthood (Bonomo, Bowes, Coffey, Carlin, & Patton, 2004; DiFranza et al., 2002; Wells, Horwood, & Fergusson, 2004). Children's alcohol use at age 14 was measured with a self-report item inquiring about the usual quantity of alcohol consumed on any given drinking occasion (≤ 1 glass vs. 1 + glasses). Child tobacco consumption was assessed with a self-report item assessing the number of cigarettes smoked in the last week (none vs. one or more).

Predictor: Paternal arrest and/or imprisonment by age 14. At the 14-year follow-up mothers were asked two questions regarding their current partner's criminal history: 'Has your current partner ever been arrested for any offence?' and 'Has your current partner ever been detained in prison for any offence?' (Prompts: No/Yes/No partner). After excluding mothers who indicated that they had no current partner (5.3%), responses to the two items were combined into a single variable with three mutually exclusive levels: 'Neither arrested nor imprisoned', 'arrested, but not imprisoned' and 'arrested and imprisoned'.

Other risk factors. Socio-economic measures included maternal age (13–19, 20–34 and 35 + years) and education (incomplete high school, complete high school, post high school) at antenatal visit. Mean income across the antenatal, 6-month and 5-year phases was calculated to obtain a scale indicating lifetime family income (low, medium or high income). Information on maternal marital status was not used since this was strongly associated ($\chi^2 = 39.88$, $p < .001$) with father's criminal history.

Maternal mental health was measured at 5-year follow-up with the Delusions-Symptoms-States Inventory

(DSSI; Bedford & Foulds, 1978), a self-report measure containing two seven-item subscales assessing depression and anxiety. The DSSI is well validated (Bedford & Foulds, 1977; Bedford & Foulds, 1978; Rubino, Pezzarossa, Zanna, & Ciani, 1997); it correlates strongly with the Beck Depression Inventory (Najman, Andersen, Bor, O'Callaghan, & Williams, 2000) and is a valid instrument for detecting major depressive episodes (Bedford & Foulds, 1977; Rubino et al., 1997). Bedford and Foulds validated the scale against clinical samples and found that a cut-off of 4 symptoms produced the optimum combination of false positives/false negatives based on Bedford and Foulds' validation studies (Bedford & Foulds, 1977). Consistent with the scale authors, in this study maternal symptoms of depression and anxiety were defined as reporting four or more of the seven symptoms in the DSSI depression and anxiety subscales.

Maternal alcohol use was measured at 5-year follow-up using two self-report items assessing frequency and quantity of consumption. Responses to these two items were combined to create two groups (< 1 glass per day, 1 + glasses per day). Maternal tobacco consumption was assessed at 5-year follow-up and mothers were assigned to one of two categories (non-smoker or current smoker).

Maternal child-rearing practices were assessed at 5-year follow-up using a monitoring-style measure (Alati et al., 2005) consisting of five items. Mothers were asked 'At what age would you allow your children to: 1) go to the movies, 2) go on holidays by themselves, 3) travel alone on a bus, 4) stay at home alone, and 5) drink alcohol?'. The index exhibited acceptable internal consistency (Cronbach's $\alpha = .61$) and scores were reclassified into: strict control, some freedom and lots of freedom.

Relationship difficulties (between mother and partner/spouse) were assessed at age 5 using the Spanier Dyadic Adjustment Scale (DAS; Spanier, 1976). The DAS is an eight-item self-report measure that assesses the quality of the relationship between couples. Items are scored on a five-point Likert scale and total scores, which can range from 10 to 50, were recoded to form a four-level variable which categorised women as having good partner relations, moderate adjustment, conflict or not being in a relationship. In this sample the scale achieved good reliability (Cronbach's $\alpha = .86$). An additional question sought to identify more severe levels of relationship difficulties, and gave an indication of possible domestic psychological and/or physical violence: 'Due to disagreement with a partner in the last seven years, have you called the police?' (Prompts: Yes/No).

Data analysis

Analyses were conducted using Statistical Package for the Social Sciences (SPSS) version 13.0 for Windows. Outcome variables were dichotomous and were predicted using logistic regression models: unadjusted models explored the bivariate association between exposures and outcomes; adjusted models controlled for other risk factors. All tests were two-tailed.

As there were only 2,399 complete cases (out of the 7,223 birth cohort sample) in the adjusted model, we

undertook a weighted analysis using inverse probability (of having missing outcome data) weights to account for those lost to follow-up. First, we fitted an exploratory logistic regression model with still in the study/lost to the study as the outcome measure. Individual and familial variables available at baseline were included in this model to determine whether participants still in the study at the 14-year follow-up differed significantly from those lost to follow-up. Adolescents not retained in the study were more likely to be born of mothers who were less educated, reported lower family income, and were more likely to smoke and be depressed at baseline (all $p < .05$). We fitted these measures in a logistic regression model (response vs. non-response as outcome) to determine weights for each individual using the inverse-probability of response (Hogan, Roy, & Korkontzelou, 2004). The regression coefficients from this model were used to determine probability weights for the covariates in the main analyses. We then compared the results from the weighted and unweighted analyses.

Results

Table 1 provides descriptive statistics for the sample, by gender. Overall, 7.6% of mothers reported that their current partner had been arrested in the past, but never incarcerated. A further 5.7% reported that their current partner had been incarcerated in the past. The distribution of participants across levels of all covariates was adequate for statistical analysis.

Table 2 presents descriptive statistics for outcomes of interest, and unadjusted odds ratios for the association between paternal arrest/imprisonment and child mental health, behaviour and substance use, by gender. By both maternal report and child self-report, approximately 9% of children exhibited clinically significant externalising symptoms, and approximately 8% exhibited clinically significant symptoms of internalising. There were significant gender differences in reports of both externalising and internalising. Based on maternal report boys (11.9%) were significantly more likely than girls (6.4%) to exhibit externalising behaviours ($\chi^2(1) = 21.68$, $p < .001$), whereas girls (9.3%) were significantly more likely than boys (6.8%) to exhibit internalising behaviours ($\chi^2(1) = 4.97$, $p = .03$). The same gender difference was evident in child self-reports; however, while girls were significantly more likely than boys to report internalising (11.0% vs. 5.8%, $\chi^2(1) = 21.70$, $p < .001$), the difference between boys and girls in self-reported externalising was not significant (9.9% vs. 8.6%, $\chi^2(1) = 1.30$, $p = .26$).

Across the full sample there was a significant relationship between paternal imprisonment and maternal reports of child externalising (OR = 2.24, 95%CI 1.41–3.57) and internalising (OR = 1.82, 95%CI 1.08–3.06). Based on child reports, externalising behaviour was associated with paternal

Table 1 Descriptive statistics for predictor and covariates, by gender

	Male ($n = 1,247$)	Female ($n = 1,152$)	All ($N = 2,399$)
Predictor			
Paternal arrest (%)	7.9	7.2	7.6
Paternal imprisonment (%)	6.1	5.3	5.7
Covariates			
Maternal age at birth (%)			
13–19	10.8	10.2	10.5
20–34	84.8	86.0	85.4
35+	4.4	3.8	4.1
Maternal education (%)			
Incomplete high	15.6	14.9	15.3
Complete high	64.6	64.3	64.5
Post-high	19.7	20.7	20.2
Household income (%)			
Low income	3.3	3.0	3.2
Middle income	80.9	83.1	82.0
High income	15.8	13.9	14.9
Maternal alcohol use (%)			
Abstainer/light drinker	95.5	95.1	95.3
1 + drinks per day	4.5	4.9	4.7
Maternal tobacco use (%)			
Non-smoker	64.8	67.8	66.2
Current smoker	35.2	32.2	33.8
Maternal anxiety (%)			
Anxious (DSSI)	17.2	15.8	16.5
Maternal depression (%)			
Depressed (DSSI)	5.8	5.5	5.6
Dyadic adjustment (%)			
Good adjustment	77.4	78.5	77.9
Moderate adjustment	14.8	14.4	14.6
Conflict	2.6	1.8	2.2
No partner	5.2	5.3	5.3
Supervision (%)			
Strict control	6.8	7.3	7.0
Some freedom	84.4	87.1	85.7
Lots of freedom	8.7	5.6	7.3
Domestic violence (%)			
Called police due to argument	3.2	3.8	3.5

arrest (OR = 1.68, 95%CI 1.07–2.63) but not imprisonment, while paternal imprisonment was associated with self-reported internalising for girls only (OR = 2.00, 95%CI 1.03–3.87). Both paternal arrest (OR = 1.70, 95%CI 1.18–2.44) and paternal imprisonment (OR = 1.68, 95%CI 1.11–2.53) were associated with alcohol use at age 14, although in the full sample tobacco use at age 14 was significantly associated with paternal arrest (OR = 1.70, 95%CI 1.11–2.59) but not imprisonment (OR = 1.62, 95%CI .997–2.64).

For boys, paternal arrest was significantly associated with increased risk of both alcohol (OR = 1.98, 95%CI 1.22–3.22) and tobacco (OR = 2.36, 95%CI 1.37–4.06) use; however, there was no significant relationship between paternal imprisonment and either alcohol or tobacco use. Conversely, girls whose father was imprisoned were significantly more likely to use both alcohol (OR = 1.83, 95%CI 1.01–3.32) and tobacco (OR = 2.41, 95%CI 1.28–4.51) at age 14. There was no significant association between

Table 2 Descriptive statistics for outcomes of interest and unadjusted model predicting child outcomes at 14 from history of paternal arrest and imprisonment, by gender

Outcomes at age 14	Male (<i>n</i> = 1,247)	Female (<i>n</i> = 1,152)	All (<i>N</i> = 2,399)
CBCL externalising (%)***	11.9	6.4	9.3
Arrest OR (95% CI)	1.44 (.81–2.58)	.77 (.27–2.18)	1.23 (.75–2.03)
Prison OR (95% CI)	2.16 (1.20–3.87)	2.30 (1.05–5.06)	2.24 (1.41–3.57)
CBCL internalising (%)*	6.8	9.3	8.0
Arrest OR (95% CI)	1.11 (.49–2.48)	.93 (.42–2.07)	1.00 (.57–1.77)
Prison OR (95% CI)	1.95 (.93–4.08)	1.74 (.83–3.65)	1.82 (1.08–3.06)
YSR externalising (%)	9.9	8.6	9.3
Arrest OR (95% CI)	1.62 (.89–2.96)	1.75 (.89–3.43)	1.68 (1.07–2.63)
Prison OR (95% CI)	1.66 (.85–3.26)	1.48 (.65–3.37)	1.60 (.95–2.68)
YSR internalising (%)***	5.8	11.0	8.3
Arrest OR (95% CI)	1.07 (.45–2.54)	.52 (.21–1.32)	.72 (.38–1.35)
Prison OR (95% CI)	1.17 (.46–3.00)	2.00 (1.03–3.87)	1.58 (.93–2.69)
Alcohol 1 + glasses (%)	15.8	17.2	16.5
Arrest OR (95% CI)	1.98 (1.22–3.22)	1.43 (.82–2.45)	1.70 (1.18–2.44)
Prison OR (95% CI)	1.57 (.88–2.79)	1.83 (1.01–3.32)	1.68 (1.11–2.53)
Tobacco in last week (%)	9.9	11.7	10.8
Arrest OR (95% CI)	2.36 (1.37–4.06)	1.11 (.56–2.21)	1.70 (1.11–2.59)
Prison OR (95% CI)	1.01 (.45–2.26)	2.41 (1.28–4.51)	1.62 (.997–2.64)

* $p < .05$, ** $p < .01$, *** $p < .001$.

paternal arrest and substance use for females at age 14.

There was no significant interaction between child gender and paternal arrest/imprisonment in predicting any outcome of interest (all $p > .05$, data not shown). Excluding those whose father had been neither arrested nor imprisoned, there was no significant difference between the children of arrested and imprisoned fathers ($n = 455$) on any outcome of interest, although the association between imprisonment and self-reported internalising symptoms approached significance (OR = 1.72, 95%CI .94–3.15) and was significant for girls (OR = 2.43, 95%CI 1.12–5.28). For girls only, compared to those whose father had been arrested, those whose father had been imprisoned were also at increased risk of

externalising, according to maternal reports (OR = 4.40, 95%CI 1.54–12.62).

Table 3 presents odds ratios for the association between paternal arrest/imprisonment and child internalising and externalising symptoms, alcohol and tobacco use at age 14, adjusted for the effects of social and familial risk factors. After controlling for these factors, and for child gender, there was no association between paternal arrest or imprisonment and child internalising, externalising or tobacco use, in the full sample. The association between paternal arrest and child alcohol use remained marginally significant (OR = 1.46, 95%CI 1.01–2.12). For boys, two associations remained significant after adjusting for covariates: paternal arrest significantly increased the odds of alcohol use (OR = 1.82, 95%CI 1.10–

Table 3 Adjusted model predicting child outcomes at 14 from history of paternal arrest or imprisonment, by gender

Outcomes at age 14	Male (<i>n</i> = 1,247)	Female (<i>n</i> = 1,152)	All (<i>N</i> = 2,399)
CBCL externalising			
Arrest	1.08 (.58–2.00)	.67 (.23–1.98)	.97 (.58–1.63)
Prison	1.42 (.76–2.66)	1.68 (.71–3.99)	1.47 (.89–2.43)
CBCL internalising			
Arrest	1.01 (.44–2.34)	.90 (.39–2.08)	.97 (.54–1.74)
Prison	1.60 (.73–3.51)	1.39 (.62–3.08)	1.44 (.83–2.49)
YRS externalising			
Arrest	1.32 (.71–2.45)	1.49 (.74–2.99)	1.43 (.90–2.27)
Prison	1.25 (.62–2.52)	1.22 (.51–2.88)	1.25 (.73–2.14)
YSR internalising			
Arrest	1.07 (.44–2.57)	.50 (.19–1.27)	.70 (.37–1.33)
Prison	1.14 (.44–3.00)	1.91 (.95–3.83)	1.59 (.92–2.75)
Alcohol (1 + drinks)			
Arrest	1.79 (1.09–2.95)	1.13 (.64–2.01)	1.46 (1.01–2.12)
Prison	1.37 (.76–2.49)	1.45 (.77–2.72)	1.42 (.92–2.17)
Tobacco (use last week)			
Arrest	1.83 (1.03–3.25)	.85 (.41–1.74)	1.31 (.84–2.04)
Prison	.67 (.29–1.55)	1.71 (.87–3.40)	1.11 (.66–1.85)

Note: adjusted for maternal age and education, family income, maternal anxiety and depression, maternal alcohol and tobacco consumption, dyadic adjustment, domestic violence and parenting style (in full sample, also controlling for gender).

2.99) and tobacco use (OR = 1.91, 95%CI 1.07–3.40) at age 14.

Among the covariates in the adjusted model, externalising behaviour was significantly associated with household income, parental supervision, dyadic adjustment, maternal anxiety, maternal smoking and child gender. Internalising was significantly associated with household income, maternal anxiety and child gender. Child alcohol and tobacco use were both significantly associated with maternal smoking and domestic violence, and child tobacco use was also significantly associated with maternal education and parental supervision (all $p < .05$).

Sensitivity analyses

History of paternal arrest and imprisonment was assessed at age 14 by asking mothers whether their current partner had been arrested or imprisoned in the past. For a proportion of mothers ($n = 445$, 18.5%) their current partner was not the child's biological father, and as such their current partner may have been arrested and/or imprisoned before meeting the mother and child. Because the presence of a (mother's) partner with a *history* of paternal arrest and imprisonment might affect the child differently to the experience of having their own *biological* father arrested or imprisoned, those for whom the mother's current partner was not the child's biological father were excluded from adjusted models, in sensitivity analyses. The results of these analyses did not differ substantively from those presented here.

To account for changes over time in maternal substance use, in a second sensitivity analysis we replaced maternal alcohol and tobacco use at age 5 with the same variables measured at age 14. Again, the results of these analyses did not differ substantively from those presented here.

Finally, we conducted a sensitivity analysis including the weighting adjustments in the model to explore whether results differed in the weighted sample. We found no substantive differences between the weighted and the non-weighted analyses, indicating that attrition was unlikely to have substantively biased our results (weighted data not shown).

Discussion

The purpose of the present study was to explore the association between paternal arrest and imprisonment, and child mental health, behaviour and substance use, in an Australian birth cohort. As predicted, paternal arrest and imprisonment increased the odds of children exhibiting externalising and internalising behaviours, drinking alcohol and smoking tobacco at age 14. Consistent with previous research (Andersson, 2002), boys were more likely to

exhibit externalising behaviours and girls were more likely to exhibit internalising behaviours, although both were equally likely to report consuming alcohol and tobacco at age 14.

The unique impact of paternal arrest and imprisonment

The second aim of the present study was to determine whether the relationship between paternal arrest and imprisonment, and poor child outcomes, could be accounted for by broader markers of risk and disadvantage. Controlling for other risk factors the associations between paternal arrest and imprisonment, and child internalising, externalising and tobacco use, and between paternal imprisonment and child alcohol use, became non-significant, suggesting that in the context of general disadvantage, paternal arrest and imprisonment may have relatively little impact on child functioning at age 14.

There was one exception to this pattern of findings: after controlling for other risk factors, boys whose father had been arrested were significantly more likely to report alcohol and tobacco use at age 14, whereas boys whose father had been imprisoned were no more likely to report alcohol and tobacco use. These findings are consistent with evidence that for children whose father engages in high levels of antisocial behaviour, imprisonment may have no impact or even a positive impact on child behaviour (Hayatbakhsh et al., 2007; Jaffee et al., 2003). Given that this pattern of results was evident only for boys it seems plausible that paternal modelling, which would be particularly influential for male children (Thornberry et al., 2003), might explain the association.

Gender variations in the impact of paternal arrest and imprisonment

The patterns of association between paternal arrest and imprisonment, and child outcomes, varied by child gender, although none of the interactions between gender and paternal arrest/imprisonment reached statistical significance. For girls, paternal imprisonment was associated with an increased risk of self-reported internalising behaviours; however, there was no increase in internalising for boys. Among girls, paternal imprisonment (but not arrest) also increased the odds of using alcohol and tobacco at age 14, whereas among boys paternal arrest, but not imprisonment, increased the odds of alcohol and tobacco use. The impact of paternal arrest on substance use among boys confirms previous findings regarding the modelling influence of antisocial fathers (Jaffee et al., 2003; Thornberry et al., 2003). For girls, the direct impacts of having a father in prison may be significant (Hagan & Dinovitzer, 1999). Future studies would benefit from the inclusion of offending mothers and fathers, in order to

further explore possible gender differences and interactions in the impact of parental arrest and imprisonment on child outcomes.

Strengths and limitations

This is one of only a small number of studies using a birth cohort to examine the relationship between paternal arrest and imprisonment and child behaviour and substance use, with measures ranging from birth to age 14. We were able to account for a range of social and familial risk factors which could account for the relationship between paternal arrest/imprisonment and child outcomes. Compared to other similar studies our sample size was large, although only a minority of fathers had experienced arrest or imprisonment. A key strength of our study is that in addition to child behaviour problems, we were able to explore other important child outcomes including internalising symptoms, alcohol use and tobacco use.

Nevertheless, the study has a number of limitations. First, due to loss to follow-up, analyses were conducted on only one-third of the original sample. Loss to follow-up may have resulted in underestimation of the association between paternal arrest and imprisonment, and child outcomes, if attrition was more common among those whose father had been arrested or imprisoned (Najman et al., 2005). However, attaching inverse probability weighting to subjects included in the analyses to restore the representation of those lost to follow-up did not produce any differences between the weighted and non-weighted results, suggesting that attrition is unlikely to have biased our results in any direction. Loss to follow-up also resulted in a substantially reduced sample size, which reduced our power to detect differences between outcomes for boys and girls, and between the impact of arrest and imprisonment.

Second, although we were able to distinguish between fathers who had been arrested only and those who had been imprisoned, we were unable to explore associations between the nature, timing and duration of paternal imprisonment and child outcomes. Given that parental imprisonment during early childhood may have a greater impact on child behaviour than imprisonment before the child is born (Murray & Farrington, 2005), it would have been useful to distinguish between these groups in the present study. We were also unable to assess fathers' mental health, behaviour or substance use. Future studies should include more detailed measures of the father's offending and prison history, and other paternal risk factors, in order to more fully explore the association between paternal characteristics and child outcomes.

Third, although we were able to improve on previous studies by including measures of child substance use at age 14, these measures were self-

report in nature. In particular, we lacked standardised measures of alcohol consumption for both mothers and children, and the measures we used also lacked a clear timeframe. We were also unable to determine to what extent the measured risk factors were (a) apparent before the onset of paternal imprisonment, or (b) caused by paternal imprisonment, and thus acting as mediators. If the latter is true, then by controlling for these risk factors we may have underestimated the effect of paternal imprisonment (Murray & Farrington, 2005).

Fourth, history of paternal arrest and imprisonment was based on maternal self-report. Previous research in the United States has shown moderate agreement between maternal and paternal reports of paternal imprisonment (Princeton University, 2002), probably due primarily to under-reporting of imprisonment by one or other respondent. At the time of reporting paternal imprisonment, participants in the present study had been engaged with the research team for about 14 years and were likely to report sensitive information accurately. Given that the reported prevalence of paternal imprisonment in this sample (5.7%) was higher than the estimated population prevalence (Quilty et al., 2004), it seems unlikely that under-reporting of paternal imprisonment would have substantially biased our findings.

Finally, although a shared genetic predisposition may partially account for associations between paternal and child externalising, internalising and substance use, we were unable to test this hypothesis in the present study. Also, we were unable to assess the impact of maternal arrest or imprisonment on child outcomes. Although the vast majority of prisoners in Australia are male (ABS, 2006), women prisoners are considerably more likely to have dependent children in the community (Woodward, 2003). Further studies including a larger sample of offending mothers will be required, in order to explore possible gender differences in the impact of parental imprisonment on child outcomes.

Conclusion

Despite claims of impaired child functioning caused by paternal imprisonment (Hagan & Dinovitzer, 1999; Quilty et al., 2004), the present study found little evidence of dysfunction unique to the children of prisoners. Instead, the impairment seen among the children of fathers who had been arrested or imprisoned, in this sample, was largely accounted for by broader risk factors such as poverty, poor family functioning and maternal substance use. In the context of broader psychosocial disadvantage, it may be that paternal imprisonment is not as damaging as once thought. Alternatively, it may be that the impact of imprisonment is mediated by these more proximal risk factors, although the present study was unable to test this proposition. Taken

together with the limitations of this and other studies, our findings should be seen as preliminary evidence only. Our results will need to be replicated using longitudinal studies that have enough power to test for gender and other differences in child outcomes, and that have more detailed and objective data on paternal behaviour and criminal history. To the extent that our findings are replicated, however, this would suggest that it is not *only* the children of prisoners who are at risk – that these children are a subset of a much larger group characterised by well-established social and familial risk factors. To the extent that support and intervention are appropriate for the children of prisoners, perhaps the same level of assistance should be provided to other, equally disadvantaged children.

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